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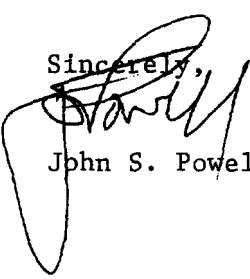
William F. Caton, Secretary
Federal Communications Commission
1919 M Street, NW
Washington, DC

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Mr. Caton:

Enclosed are the original and 9 copies of my Comments on WT Docket 96-86 for distribution to the Commissioners and FCC staff.

Sincerely,


John S. Powell

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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In the Matter of)
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The Development of Operational, Technical, and)
Spectrum Requirements for Meeting Federal, State)
and Local Public Safety Agency Communications)
Requirements Through the Year 2010)

WT Docket 96-86

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To: The Commission

COMMENTS OF JOHN S. POWELL

These comments are being submitted by a twenty-three year veteran police sergeant who "works the street" each shift supervising officers on a major public university campus in the metropolitan Eastbay area of San Francisco, California. I am concerned that my staff has access to state-of-the-art technologies, coupled with sufficient spectrum in which to properly implement and use them, to provide safe and efficient public safety services to our community. More importantly, sufficient communications spectrum must be made available so that emergency medical, fire, law enforcement and other public safety service providers can respond quickly to calls for assistance from both the public and our fellow personnel. Whether the need is for emergency medical, fire, law enforcement or a myriad of related health and welfare requirements, our common goal is that the public must be safe and public safety personnel must be able to return safely to their families at the end of each shift. There can be no higher domestic priority for the Commission than to take actions which promote those goals.

BACKGROUND

I am providing comments as an individual with significant public safety communications background and experience. I graduated from the University of California at Berkeley with a BS degree in electrical engineering in 1973 and immediately began a law enforcement career with the UC Police Department; I was promoted to sergeant in 1977. I have supervised Patrol, Communications & Records, Administration, Special Projects, Crime Prevention and Emergency Preparedness. While assigned to Communications, I designed and implemented UC's E-911/Computer Assisted Dispatch Center and recently participated in the development and award of a contract for a statewide 800 MHz NPSPAC¹ trunked radio system serving all units of the University's nine campuses and four medical centers. I supervised a mutual aid unit in the city of Santa Cruz following the 1989 Loma Prieta earthquake and coordinated communications in a field command post during the 1991 Oakland Hills Fire. I have been a member of the Association of Public Safety Communications Officials, International (APCO) for 24 years, serving as President of the Northern California Chapter for two terms and as President of APCO International, during 1992-93. I chaired APCO's Law Enforcement Advisory Committee for three years, was President of the APCO Automated Frequency Coordination² (AFC) Board of Directors for three years and have been a member of APCO Project 25's Steering Committee since its inception in 1989, co-chairing Project 25 during 1992-93. As a member of the APCO Board and as APCO President, I had the opportunity to work closely with the FCC and Congress to address important issues of Spectrum Refarming, the protection of state/local government 2 GHz microwave assignments, the allocation of new public safety spectrum, and securing a Congressional mandate for a public safety spectrum needs study

¹ The National Public Safety Planning Advisory Committee (NPSPAC) developed recommendations adopted by the Commission for the 821-824/866-869 MHz public safety band; see *Report & Order*, Docket 87-112.

² APCO AFC is the wholly-owned non-profit subsidiary of APCO which performs frequency coordination functions in the Police and Local Government Radio Services and for all public safety services in the 420 and 800 MHz bands assigned to APCO by the FCC.

in the Omnibus Budget Reconciliation Act of 1993³. During the recent Public Safety Wireless Advisory Committee (PSWAC) process, I served as a member of APCO's PSWAC Task Force and participated actively on all of the subcommittees, particularly Interoperability (where I chaired the Future Interoperability Needs Working Group), Spectrum Requirements, and Technology. I have been a member of the California Legislature's Joint Committee on Fire, Police, Emergency and Disaster Services and currently serve as a member of the California Governor's Office of Emergency Services (OES) CLEMARS⁴ Advisory Committee. I am a life member of APCO, a member of the Communications Committee of the International Association of Chiefs of Police (IACP), a member of the Institute of Electrical and Electronic Engineers, and a fellow of the Radio Club of America.

Based on this experience, I am submitting these comments as an individual. They do not necessarily represent the views of my employer nor any of the above organizations, many of which will be submitting their own comments on these issues. Below, I present several options on spectrum allocation which will, at the least, be controversial. However, it is important that they be presented to allow for further comment from interested parties.

THE NOTICE

Most of the issues raised in the Commission's *Notice* are addressed in the recent PSWAC *Final Report*. The *Final Report* represents the most comprehensive assessment of Public Safety communications needs ever compiled. Its conclusion that immediate action is necessary by the Federal government to avert a public safety

³ Public Law #103-66, Title VI, §6002, 107 Statute 312 [47 CFR §309(j)(10)(B)iv].

⁴ The California Law Enforcement Mutual Aid Radio System (CLEMARS) is the nations largest law enforcement mutual aid radio system with over 48,000 portable, mobile and base stations licensed by the FCC.

crisis can not go unheeded. I strongly urge the FCC to implement the key recommendations in the *Final Report* as quickly as possible.

APCO, the IACP and other public safety organizations have long urged the Commission to address the serious spectrum shortages facing public safety agencies. Without access to new and interference-free spectrum, public safety agencies will be unable to provide even basic emergency communications and will certainly be unable to implement new communications networks and technologies that will enhance their ability to protect the safety of life and property in coming years.

Virtually every after-action report following major disasters and interagency task force operations cites a lack of communications interoperability as a major problem. New spectrum allocations are necessary to provide critical interoperability between public safety agencies that must communicate on a daily basis, as well as during an ever increasing number of natural and technological disasters, to coordinate emergency response activities.

Unfortunately, the PSWAC process finished its work just as another important FCC action was released. The pending Digital Television ("DTV") proceeding, MM Docket 87-268, includes a proposed channel allotment that could lead to the immediate reallocation of a portion of the spectrum now used for UHF television channels 60-69. That spectrum is adjacent to the 800 MHz mobile radio bands already used by a number of public safety agencies, and would therefore facilitate development of equipment that would be interoperable with current public safety systems. This spectrum could be used to implement new public safety communications technologies and to provide spectrum relief in congested metropolitan areas. Furthermore, proposed changes to current broadcast television channel assignments present interesting opportunities to

secure the additional public safety spectrum required in bands below 512 MHz for interoperability and to build wide area systems, as recommended in the PSWAC *Final Report*. A lack of overlap between completion of the PSWAC *Final Report* and the release of MM Docket 87-268 did not allow the PSWAC Subcommittees any time to formally review the MM 87-268 proposal. However, significant discussion regarding the DTV proposal has taken place among a number of former Subcommittee members. This discussion is the basis of several of the options presented below.

I believe the PSWAC *Final Report* and the five PSWAC subcommittee reports fully and accurately address most of the issues raised in the Commission's *Notice*. My comments below focus only on those issues that I believe require clarification and on other spectrum options not presented in the *Final Report* or *Notice*. Last, I fully support the spectrum recommendations contained in the PSWAC *Final Report*. Spectrum that is critically needed for public safety use now and in the future can not be allowed to be auctioned or otherwise used in a manner of secondary importance to the needs of public safety, mandated in the Communications Act as second in priority only to the national defense.

SPECIFIC COMMENTS ON THE NOTICE

A. INTEROPERABILITY ISSUES

1. Public Safety Definitions

I fully support the Public Safety definitions described in the PSWAC *Final Report* and the Interoperability Subcommittee Report. In the past, use of a definition which listed the types of services has very much clouded the issue, leaving some services to be treated as second class citizens. Indeed, many instances can be cited where traditional "emergency first responder" services (a definition which typically only includes

emergency medical, fire and law enforcement) are provided in part or wholly by one of the other non-traditional services. For example, in remote forest areas, a ranger operating in the Forestry-Conservation Radio Service may provide the only “first responder” services to local residents until the arrival of support hours later. In fact, the California Department of Forestry and Fire Protection, arguably now the nations largest fire department, operates almost exclusively on Forestry-Conservation Radio Service frequencies. The PSWAC definition encompasses a broad classification of public safety entities, focusing not only on the protection of life and property, but also on other vital governmental services which protect and service the public welfare as well as those, often non-governmental, agencies and organizations which support public safety agencies. In paragraph 25 of the *Notice*, the FCC asks if the proposed definitions are sufficiently broad to encompass all functions and responsibilities of various public safety agencies. I believe it is important to consider that all functions of government must work together on an ongoing basis to provide the quality service demanded by the public. Further, the FCC must realize that there is no other spectrum provision for private radio systems for use by state and local government outside of the current Local Government Radio Service. Thus, the expressed intent to include the broadest array of governmental entities within the concept of public safety is appropriate. However, after proposing to adopt the PSWAC definitions, paragraph 32 of the *Notice*, while discussing the San Diego Regional Communications System (RCS), defines the “California Department of Transportation and those county agencies responsible for providing citizens with services other than law enforcement, fire and disaster preparedness” as public service agencies. The PSWAC definitions were clearly intended to place such governmental organizations as these within the “Public Safety Provider” category. The “Public Service” category was specifically intended to cover such organizations as private railroads and utilities which have incident-specific needs to interoperate with public safety organizations. PSWAC proposed that public safety spectrum would be available to public service entities only for purposes of interoperability with public safety agencies on an incident-specific basis.

In addition, the PSWAC definitions provide that non-governmental entities, for example a private ambulance company providing emergency medical services under contract to a county government, may be authorized by the appropriate governmental entity to perform a public safety function as either a "Public Safety Services Provider" or "Public Safety Support Provider". I strongly support this concept, with the provision that all public safety frequencies are licensed to the government agency. In paragraph 32, the FCC notes that the State of Nevada is implementing a statewide system in conjunction with a power utility company. Significant concern has been expressed by non-state public safety agencies that public safety frequencies could be licensed to the power company, allowing them to load non-public safety users onto these channels and depriving these other agencies of much needed spectrum in congested metropolitan areas such as Las Vegas, as well as in nearby regions of Arizona and California. The FCC must enact rules that only permit public safety agencies to hold licenses for public safety frequencies, requiring partitioning of consolidated systems to permit only public safety users on public safety channels. However, the PSWAC definitions also recognize that non-governmental entities categorized as "Public Services" need interoperability with public safety agencies on an incident-by-incident basis. The FCC needs to designate specific frequencies in each band for such interoperability and allow for licensing of all appropriate users.

Finally adoption of these definitions may enhance the introduction of some private sector technologies into the public sector. For example, hazard mitigation and warning systems being developed for the railroad and trucking industries as part of the Intelligent Transportation System (ITS) could be more easily introduced into the public sector due to the closer working relationship spawned by improved cooperation in developing interoperability plans and systems. Likewise, public sector technology (such as Project 25, which has already

been embraced by the railroad industry) could realize a wider acceptance in the private sector to enhance interoperability.

2. Interoperability Definition

The PSWAC definition of interoperability was adopted after considerable discussion. I fully support the definitions of interoperability contained in the PSWAC Interoperability Subcommittee Report. The definitions should enhance the ability of federal, state and local agencies to address the complex issues of interoperable communications.

3. Interoperability Needs

The PSWAC interoperability needs finding divides interoperability into the three categories of *day-to-day*, *mutual aid*, and *task force*. These categories are based on very clearly defined characteristics which are included in detail in the PSWAC Interoperability Subcommittee Report⁵.

These definitions provide a method to clearly identify interoperability needs. Importantly, it must be emphasized that the number of lives impacted by day-to-day interoperability requirements across the country far outnumber those impacted by the two other types of interoperability. Mutual aid incidents, while often planned for in concept, are normally unannounced and unplanned in occurrence. Communications coverage for command/control of mutual aid incidents is usually required throughout the impacted area. Contrast these latter requirements with those for task force events such as drug interdiction operations which generally are characterized by involvement of multiple levels of government (federal/state/local) and include advanced

⁵ I am particularly familiar with these categories because they are based on a presentation I made on September 19, 1995, to a symposium sponsored by the Federal Law Enforcement Wireless Users Group (FLEWUG) in Tysons Corner, VA.

detailed planning and carefully controlled participation. While task force communications coverage may be required over large areas (as suspects move, for example), communications is generally local and often covert in nature. I am concerned that the FCC has strayed, in paragraph 30 of the *Notice*, from these definitions, clearly confusing the mutual aid and task force definitions. The FCC needs to use the PSWAC definitions as the basis for decisions regarding interoperability needs.

4. Interoperability Options

The PSWAC *Final Report* and Interoperability Subcommittee Report properly address most of the issues in this section of the *Notice*.

While the first option, relocating all public safety communications to a single band, appears to resolve most of the problems, it does not consider the differing spectrum characteristics that make certain frequencies desirable for specific types of operations. For example, lower frequency (150-174 MHz) bands tend to be more desirable for wide area systems while higher bands (800 MHz) provides improved building penetration desirable in metropolitan areas. In any case, these requirements also are very dependent on terrain and specific system implementations. Last, it will be nearly impossible for the FCC to identify sufficient spectrum in any usable band to implement this option.

In paragraph 38 of the *Notice*, the Commission seeks comment on various means of achieving interoperability. As background in paragraph 35, the Commission states that migration to a new band may present opportunities for commercial systems to offer interoperability solutions. This statement causes me great concern. Interoperable radios (whether part of the normal radio system or a separate radio) must have all of the characteristics of a normal public safety radio, including reliability, interference protection, ubiquitous

coverage, user control, excess capacity (for major emergencies), immediacy (i.e., without waiting for a dial tone), and security, that commercial providers are unlikely to provide in a competitive environment. In paragraph 36, the Commission discusses multi-band radios. At least one manufacturer offers a dual band public safety radio supporting communications in the 150-174 and 450-470 MHz bands today. While type acceptance could be used as a process by which the FCC would require operation on an interoperability band, it does not mean that dual-band equipment can be built nor would be affordable. Manufacturers have indicated it would be extremely difficult to build a dual-band radio with one of the bands operating at 800 MHz; a major problem being dual-band antenna design. Today's dual-band antennas, particularly those designed for portable equipment, tend to be inefficient, leading to the need for higher powered transmitters requiring higher capacity batteries for portable operation. Fortunately, the 450-470 MHz band is a multiplier of 3 in frequency from the 150-174 MHz band; this makes dual-band antennas for these two bands easier to design and more efficient. Nonetheless, inefficiencies in antenna systems could also lead to a need for increased infrastructure to overcome signal losses, posing a costly solution.

Also in paragraph 36, the FCC proposes "inexpensive software programming" to modify much of the mobile and portable equipment currently employed" so that it could operate on the new mutual aid channels. This option is generally only possible if the interoperability frequencies fell within one of the existing bands and on existing channel centers, as most of today's equipment is not capable of even reaching the newly "refarmed" channel centers. That implies that these interoperability channels would have to come from existing inventories with the resulting requirement to relocate large numbers of incumbents.

In paragraph 37, the Commission discusses Cross-Band Repeaters and Gateways. I note that a gateway in theory does provide limited protocol conversion (the Technology Subcommittee agreed, however, that it

would generally not be possible to gateway systems using different digital vocoders); however, if the radios operate in different bands, cross-band repeaters will still be needed, bringing with them the spectrum inefficiency of requiring one frequency per system in each operating band. Cross-band repeaters and gateways are, nonetheless, considered to be short-term solutions, provided that infrastructure is in place to support their implementation. The UC Berkeley system currently uses a cross-band repeater quite successfully to intertie the City of Berkeley Police primary dispatch frequency into UC's 800 MHz trunked radio system.

The PSWAC report offers the most promising solution to the interoperability issue. The final proposal of the PSWAC Interoperability and Spectrum Subcommittees, adopted as a Key Recommendation by the Steering Committee in paragraph 2.2.1 of the *Final Report* supports designating 2.5 MHz of interoperability spectrum in a new interoperability band between 138 and 512 MHz. I offer the following support for this recommendation:

- If the new interoperability band falls within a current band (such as 470-512 MHz) users of that band can immediately access the interoperability channels and their regular working channels from the same radio today. Importantly, today's largest base of public safety equipment is within the 450-512 MHz band in the major metropolitan areas of the United States.
- If the new interoperability band is adjacent to a current band (such as at 174 MHz) users of that band will be able to access the interoperability channels in the near future (as manufacturers quickly gear up to support this new band) and their regular working channels from the same radio. Use of TV-7, for example, would eventually allow users of the 150-174 MHz band (including most federal and many statewide law enforcement agencies, and most fire agencies) to access these channels directly from their normal working radios.
- In either case, at least one dual-band radio is already available covers these two critical bands. With bandspread improvements, dual-band radios would allow users in either of these bands to access the new interoperability channels whether those channels were adjacent to or within either the 150-174 or 450-512 MHz band.
- The Commission correctly points out the advantages of migrating to this type of system.
- The Commission correctly identifies the need for a "common interoperability standard" for this implementation.

Critical to interoperability needs is moving as quickly as possible to implement a new band. To that end, if non-public safety spectrum is identified as the only option (and it certainly appears that is the case), then the FCC, NTIA and public safety users should jointly propose that federal funding such as auction revenues be used to move incumbents to other spectrum as quickly as possible. Federal, state and local agencies spend millions of dollars each year buying and installing multiple radios for their vehicles for the sole purpose of interoperability. Implementation of a single interoperability band would limit the need for additional equipment to a single "interoperability radio" if an agency could not access the interoperability band from its normal working radio. Ideally, the band selected for the new interoperability band would be close to or within spectrum used by a large number of public safety agencies, allowing for either an immediate reprogramming of existing equipment when the spectrum became available, or a graceful migration as new equipment is purchased.

In paragraph 40 of the *Notice*, the Commission requests comments on the number of interoperability channels and where they should be located. The FCC's conclusions with respect to channel counts are based on early PSWAC discussions. Ten pairs was found to be woefully inadequate for even the moderate incidents encountered regularly across the country. The PSWAC Interoperability Subcommittee examined a number of incidents and found the following number of channels were required to meet both current and future needs; a detailed discussion and diagrams depicting incident-specific uses for these channels is included in the PSWAC Interoperability Subcommittee Report. Thus, the final Interoperability Subcommittee Report recommendation adopted by the PSWAC Steering Committee was as follows:

- Establish five (5) repeater pairs in each of the existing public safety VHF Bands (40-50 MHz and 150-174 MHz) and in the public safety UHF band (450-470 MHz). These would be coupled with existing designated simplex channels in some of the bands; those existing channels that are service-specific would maintain those designations. Five pairs are already designated in the 800 MHz NPSPAC band. These

channels are reserved primarily for day-to-day and task-force use by agencies with current equipment. The Spectrum Subcommittee discussed using refarmed channels, as well as other lightly used spectrum such as the older IMTS mobile telephone channels in the 150-160 and 450-460 MHz bands for these five pairs.

- Establish a new interoperability band in spectrum between 138 and 512 MHz, designating 80 simplex channels and 40 repeater pairs exclusively for shared interoperability according to a priority system, using 12.5 kHz channels. Band plans would be developed at the national level, with the possibility of regional input with respect to operational procedures. Additionally, designate four (4) 125 kHz channels for wideband data and video these 125 kHz channels should support 384 kbps data transport at 3 bps/Hz. This proposal uses a total of 2.5 MHz of spectrum⁶. *It is critical that this spectrum be dedicated solely to interoperability throughout the United States and that it be the same spectrum throughout the United States.*
- Support the priority system referenced in paragraph 40 of the *Notice* and the PSWAC ISC Report.

In paragraph 41 of the *Notice*, the Commission seeks comments on a common mode and frequency band.

While generally opposing mandates, I believe there are limited cases where mandates are essential. I support the Commission's proposal and make following points:

- Key to the success of any interoperability plan is developing standardized channel nomenclature to identify each channel; use of this nomenclature both in display on the equipment and in over-the-air reference must be mandated by the Rules.
- While it may be outside the realm of the FCC (perhaps more a function of the Federal Emergency Management Agency or the individual States), interoperability will not be successful without adoption of a universal system such as the Incident Command System. Interoperability will also not be successful without mandatory planning and training in its use⁷, coupled with a national certification for Communications Unit Leaders (CUL) and a requirement that incidents above a certain size require a certified CUL for communications management.
- Mandating dual-band equipment may be premature. In particular, it will be difficult or impossible to provide dual-band equipment involving the 800 MHz band.

⁶ Separation for mobile relay operation would require some spacing beyond 2.5 MHz. Ideally, the 2.5 Mhz would come from a larger allocation which included channels for a use such as the Public Safety Wireless Network (PSWN).

⁷ For example, within California, the California Code of Regulations, Title 19, Division 2, defines a Standardized Emergency Management System which is identical to ICS. §2443 of this law requires compliance with training requirements before an agency is eligible for reimbursement for disaster-related expenditures following a disaster.

In paragraph 42 of the Notice, the Commission seeks comment on type acceptance requirements for public safety radios to be capable of operating on mutual aid channels. I supports the Interoperability Subcommittee recommendation adopted by the PSWAC Steering Committee which defines an immediate analog baseline of 25 kHz, with a mandatory migration to 12.5 kHz on January 1, 2005. I also strongly agree with the PSWAC recommendation that in the future these standards must address a digital baseline; the logical choice for this digital baseline standard is APCO Project 25.

It is critical for the Commission to note that interoperability is, by its very nature, implemented in different ways in different parts of the country to meet specific organizational and political needs and requirements. It is important that significant flexibility be allowed for regional planning in implementation of any interoperability plan. With respect to frequency assignment and use within a designated interoperability band, the appropriate region would be composed of a common radio coverage area, as was the case with NPSPAC. With respect to administration and operational planning, the most appropriate regions would appear to be the individual states.

B. OPERATIONAL ISSUES

1. Service Features

The PSWAC Final Report generally covers this subject well. Clearly, future service features will use technologies that will require spectrum. The nature of these features will be toward those technologies that require wider, rather than narrower, bandwidths. As the suite of features identified in paragraph 48 of the *Notice* becomes available at reasonable cost, as is sure to happen as similar technologies become available to the general public, they will be in demand for public safety services. It should be noted that many of these will simply be applications running on laptop-type personal computer platforms.

Importantly, in paragraph 47, the Commission states, "We are not persuaded that all of the communications needs identified by the public safety community can be met solely through the spectrum allocation process. Consequently, we believe that prioritizing needs is an essential step to ensuring that spectrum is allocated and services delivered in the most efficient and effective way possible". The issue of priorities was discussed at length by the PSWAC. The consensus of users was that it is not necessary to prioritize critical public safety uses. Instead, it is necessary to again remind the Commission that the Communications Act requires that the Commission prioritize public safety uses above those of all others except national defense. The PSWAC performed its assigned task of conducting the most detailed analyses of public safety spectrum needs ever undertaken in an admirable fashion. It is now the Commission's responsibility by law to allocate required spectrum for public safety services.

2. System Requirements

In paragraph 52, the Commission suggests that a group of channels may be designated for single-channel operation provided these channels are shared and licensees tolerate some level of interference. Such a proposal is completely unacceptable for any agency whose personnel may need instant, interference-free communications for safety of life situations. This surely includes the traditional "emergency first responder" agencies, and probably includes most public safety agencies.

In paragraph 53, the Commission discusses features of advanced networks and trunking systems. It is important to note that these systems must be properly designed to realize these benefits.

In paragraph 55, the Commission requests comment as to "whether public safety licensees, as a general matter, should be required to utilize joint networks for their public safety communications." Clearly there are

reasons of cost reduction and spectrum efficiencies that should lead agencies to build joint networks. There are also organizational and political reasons that agencies may not want to join networks. While the FCC can and should certainly consider incentives to construct networks, the final decision must be left to the individual licensee. Agencies must be free to operate in the manner they consider most appropriate to meet local needs.

C. Technology Issues

In this section of the *Notice*, the Commission identifies four (4) types of technologies (CDMA, FDMA, TDMA and a family of narrowband technologies more properly called linear modulations) and seeks comment as to each technology's application to public safety. These technologies are clearly discussed in the PSWAC *Final Report* and I agree with those findings. The Commission appears concerned with the efficiencies offered by each technology. There are a number of issues that must be considered with respect to efficiency. They include the ability to transfer information rapidly, but also include coverage requirements (public safety systems tend to be one-to-many rather than one-to-one such that cellular approaches have little benefit), availability of clear channels for emergencies, the need for direct unit-to-unit communications, etc.

Each of these technologies has its own particular application, a number of which are discussed in the PSWAC Technology Subcommittee Report. Some are better than others for certain uses. The plethora of digital technologies on the horizon led APCO to form Project 25 in 1989 to primarily address interoperability, graceful migration and competitive procurement, while at the same time utilizing the most proven, spectrum efficient technologies that could be identified. FDMA was chosen for Project 25 Phase I (12.5 kHz bandwidth) because a group of industry and user experts felt that, considering the above requirements, it most closely fit the needs of the largest group of users. Separate comments being filed by the Project 25 Steering Committee will discuss this Project in detail.

In paragraph 64, the Commission discusses increased sharing through maximum reuse. Unfortunately today, most private land mobile frequencies are coordinated based on maximum co-channel separation, rather than on minimum co-channel separation based on acceptable levels of interference. The Commission has certainly been responsible for promulgating some of this practice by limiting the content of its databases. For example, the lack of a clearly defined area of operation for mobiles, the lack of pairing (or at the least recording of the paired receive frequency) in the 150-174 MHz band, and the lack of fields to record subaudible squelch tones or digital squelch codes clearly limits the ability of coordinators to maximize reuse. APCO has gone to great lengths to maximize reuse and limit interference by using local advisors who are familiar with geographic characteristics and generally know the major users in each area of the country. The Commission must not take any action that would hinder the delivery of that quality of service to licensees. The Commission further discusses the use of specialized antennas. To the extent possible, coordinators should be allowed maximum flexibility to control antenna patterns, effective radiated power, and other factors which will limit a transmitted signal to the appropriate political boundary and required surrounding area for each licensee.

In paragraph 65 of the *Notice*, the Commission discusses trunking. As previously stated, this technology must be carefully implemented. The assumed 2.7 efficiency advantage for trunked systems clearly is dependent upon the size of the system (number of trunked channels) and other characteristics, many of which are implementation-specific (for example the mix of user agencies, use of simulcast, etc). For some applications, particularly smaller systems or systems with specific coverage requirements (such as a prison), use of a conventional system may be far more efficient. Large, multiple agency systems are generally to be supported. However, these often simulcast a number of channels at many sites; it is undesirable to include small, local users (such as jails) in this simulcast environment.

In paragraph 68 of the *Notice*, the Commission asks if should specify technical standards for both receivers and transmitters. As technology moves forward, such equipment standards will become mandatory. The FCC needs to consider the work of the TIA TR-8.8 Committee with respect to this issue. Finally, implementation of these multiple technologies will require a complex database for proper frequency coordination. The FCC is the proper organization to maintain such a database.

D. Spectrum Allocations

1. Overview

The PSWAC Spectrum Requirements Subcommittee Report includes the most detailed evaluation of public safety spectrum needs ever conducted. As a participant in this process, I fully support the Key Recommendation in Section 2.2.1 of the *Final Report*, and urge the Commission to move quickly to satisfy those requirements, both immediate (25 MHz, plus an additional 2.5 MHz in bands between 138 and 512 MHz) and long term (an additional 70 MHz by the year 2010).

2. Spectrum Allocation Options

In paragraph 72 of the *Notice*, the Commission requests discussion on the potential impact of new technologies on spectrum congestion. PSWAC's Technology Subcommittee discussed this in detail. While it is seen that technology will offer some solutions, such as narrower bandwidths for voice systems, there will be a lag in implementation of these technologies as systems must be amortized. At the same time, there will be technologies introduced into the field, such as NCIC-2000, that will require vast amounts of new spectrum. Unfortunately, these new technologies appear to require wider, rather than narrower, bandwidths to support high speed data and video applications.

In paragraph 73 of the *Notice*, the Commission tentatively concludes that “allocating additional public safety spectrum is not likely to satisfy the current and emerging needs of public safety communications systems.” While research by the PSWAC Spectrum Requirements Subcommittee has certainly shown this will be the case, nonetheless the immediate allocation of an additional 25 MHz of spectrum is deemed absolutely critical.

Before proceeding with several spectrum options, it is important to describe how I arrived at needing an additional 12 MHz of spectrum in the immediate future from within the 138-512 MHz band.

The need for spectrum for wide areas systems can not be overemphasized. Many state police and highway patrol agencies currently use low band (40-50 MHz) as their primary band. Major manufacturers have recently notified the California Highway Patrol (CHP) that they will no longer be manufacturing base station equipment for this band. In California, there is no affordable alternative except for spectrum in the 138-512 MHz bands.⁸ While states such as Florida and Michigan have moved to 800 MHz, the terrain and size of the systems differ significantly as compared to California and other western states. Many states are now examining the possibility of building consolidated statewide systems serving all state agencies. The belief was that, if requirements could be met for the State of California, they could in all probability be met for any other state. With that in mind, discussion ensued as to how much spectrum would be required for their system. California has long believed that they could build a workable system within a 6 MHz allocation in the 138-512

⁸ A mid-1980s study by the CHP identified the need to construct over 50 new sites to maintain their mobile coverage contours if they moved to 800 Mhz. At prices which today often exceeds \$200,000 to acquire, construct and equip an new site, coupled with the current requirement to provide portable coverage in much of their service area, the cost has become prohibitive to move to the 800 Mhz band.

MHz band, leaving some spectrum for other users and noting that significant other spectrum now in use would be released as agencies moved to the consolidated system.

This need extends beyond voice systems to the myriad of new technologies waiting to be introduced. Again, it will be cost prohibitive to build these systems, particularly in rural and mountainous areas, on spectrum in bands above 512 MHz.

The Public Safety Wireless Network (PSWN)⁹ is discussed in detail in the PSWAC Report. It is important to summarize the need for this network. It is envisioned that PSWN can function as "a private, wireless public-safety lane on the information superhighway", again offering those features of reliability, interference protection, ubiquitous coverage, user control, excess capacity, immediacy, and security, that commercial providers are unlikely to provide in a competitive environment, particularly in more rural environments. I presented a plan to members of the PSWAC Spectrum and Interoperability Subcommittee at the close of the

⁹ Vice-President Gore, in his program for a National Information Infrastructure, called for development of a national law enforcement and public safety wireless network. This network would provide the backbone and distribution medium(s) for voice and for advanced technology between information processing centers/repositories and field personnel at all layers of government.

On April 20, 1994, the Federal Law Enforcement Wireless Users Group (FLEWUG), co-chaired by the Justice and Treasury Departments, was formally chartered and tasked with research and planning for such a network. The FLEWUG plays an important function within the National Performance Review's charter to "Reengineer Through the Use of Information Technology." Its mission is clearly stated in the NPR Information Technology IT-04 Vision Statement:

"To provide law enforcement and public safety an integrated wireless/wireline network that meets the functional requirements of the user community. As envisioned, the network will incorporate spectrally efficient technologies, support interoperability, and be secure. Network planning and development will be sensitive to individual agency issues such as priorities and privacy, will provide virtual autonomy and non-interfering operations, and will include flexibility to expand and extend capabilities. Cooperative and coordinated system development efforts between multiple agencies will relieve the effects of diminishing resources such as funding and radio spectrum and will result in numerous cost and quality of service advantages."

In April, 1996, the US Justice Department formally authorized and funded the FLEWUG Program Management Office (PMO). "The purpose of the PMO is to organize, direct and manage the multitude of tasks that must be completed..... the PMO will receive guidance and direction from the FLEWUG in coordination with participating state and local "partners." The PMO will establish project teams made up of experts drawn from government, industry and academia to address specific items of interest. Such teams will be assembled on an as-needed basis and dismissed when their work is completed.

PSWAC deliberations. This plan coupled 14 PSWN channel pairs (each pair consists of two 125 kHz channels capable of supporting 384 kbps/second data speeds) with the 2.5 MHz of interoperability spectrum described above, for a total of 6 MHz, the bandwidth of one broadcast television channel; channel layout was appropriate to support mobile relay use of both the 40 voice channel pairs and the 14 PSWN pairs.

An immediate opportunity to allocate additional spectrum for public safety is in the aforementioned DTV proceeding (MM Docket 87-268), where the Commission has proposed the reallocation of spectrum now occupied by UHF Channels 60-69 (reference footnote 39 of the *Notice*). UHF Channels 60-69 occupy spectrum immediately adjacent to the 800 MHz frequency bands used today by many public safety agencies. While I strongly support this concept, I note with concern that the proposed allocation table in MM 87-268 leaves a number of TV channels remaining on this spectrum in major metropolitan areas. Importantly, according to that plan, there is no common spectrum available for public safety in the TV 60-69 band nationwide!

A second alternative for additional 800 MHz spectrum would relieve the Commissions current problem with attempting to auction SMR spectrum in the lower 800 MHz band where licensing is currently frozen. Considering the embedded base of public safety equipment in this lower band on frequencies which are interleaved so that it is virtually impossible to consider the spectrum as a block, the Commission could examine auctioning spectrum in the TV 60-69 band for ESMR and other commercial uses, releasing an equivalent portion of spectrum in the 806 MHz band for public safety use. The benefit of this option to public safety is that virtually all existing NPSPAC equipment is capable of operating throughout the 806-824/851-869 MHz bands, providing immediate interoperability and growth opportunities without replacement of equipment.

An additional opportunity presents itself in the lower TV channels. The PSWAC Spectrum Subcommittee clearly documented the need for spectrum for wide area systems and for interoperability in the 138-512 MHz bands where most public safety systems operate today, bands which are also occupied by TV channels 7-20. In particular, as part of the DTV channel allotment, moving the bottom of the "core DTV spectrum" up to the base of channel 9 (187 MHz) would make available an additional 12 MHz of VHF spectrum immediately adjacent to existing public safety spectrum used by federal, state and local agencies. In particular, I would propose that TV-7 (174-179 MHz) be allocated for interoperability and TV-8 (180-186 MHz) be allocated primarily for wide areas systems.

A careful examination of the proposed allocation tables in MM 87-268 presents yet another option for spectrum in the 470-512 MHz band. With the intent of clearing all broadcast television use from TV channels 14-18 (470-500 MHz), a manual repacking of the tables for the San Francisco area and found that it appears possible to clear these channels with minimum coverage impact on the television stations, as described later in this section. As it appears that the Commission made minimal use of terrain features in making co-channel assignments of DTV stations, it was possible with knowledge of local terrain to space stations much closer than the proposed allocations. Clearing these 5 UHF channels will provide a minimum of 12 MHz additional spectrum throughout the United States (Los Angeles and New Your City are already using 18 MHz in this band). This option proposes designating TV-14 (470-476 MHz) as interoperability/PSWN spectrum because it falls closest to existing public safety spectrum at 450-470 MHz. A number of manufacturers make broadband radios today that cover the 450-486 MHz band. This would require eventually relocating existing TV-14 users to one of the other channels in the 15-18 block, but would provide all areas of the country with at least 6 MHz of new spectrum (areas other than LA and NYC would receive substantially more) above and

beyond the new interoperability band. The additional 6 MHz would be usable for building wide area systems such as those envisioned by some states (including California and Colorado). A preliminary examination shows that 470-500 MHz could likewise be cleared in Southern California (although public safety users in the 500-512 MHz band would also eventually have to relocate to lower channels).

While the 174-186 MHz spectrum might appear more desirable, the apparent philosophy of the Commission in allocating new and transition TV channels for DTV in MM 87-268 is to provide new channels with coverage that is consistent with that of the original TV assignment. That has resulted in stations being authorized extremely high effective radiated powers (often exceeding 3 megawatts) for assignments moving from VHF channels to UHF channels. Because these power levels, coupled with placing a significant number of such high powered stations at popular sites such as the World Trade Center in New York City and Sutro Tower in San Francisco, would pose significant costs and public health risks, it is anticipated that these VHF stations will desire to convert to DTV while maintaining their current VHF assignments, where possible. However, for stations already operating at UHF, whether they move into 470-500 MHz spectrum or are forced slightly higher (just above 500 MHz) has little impact on their operating parameters. Thus claiming the 470-500 MHz spectrum for public safety use may prove more feasible and meet less broadcast resistance than its VHF alternative. In any case, there is sure to be significant broadcaster objection to any further loss of spectrum to non-broadcast use.

Finally, the PSWAC report fails to recognize the significant need for additional fixed microwave spectrum in bands above 2.0 GHz. Detailed, quantitative studies conducted by the PSWAC Spectrum Requirements Subcommittee have shown that this need will approach or exceed the need for spectrum in lower bands in some areas of the United States.

E. Transition

1. Increased Use Of Commercial Services

It appears that the Commission is again greatly exaggerating the role of commercial services in meeting the future spectrum requirements of public safety. This topic was discussed extensively within PSWAC. It was finally decided that only a small portion of public safety needs, perhaps 10%, could be met by commercial services, including extremely limited use for any mission critical functions. Public safety agencies already make extensive use of commercial services for non-mission critical, primarily administrative, communications. Cellular telephones and pagers have especially proven to be valuable to provide support communications to public safety agencies. Commercial systems are designed to provide service to the largest possible number of users at the lowest possible cost. Coverage is not necessarily provided in areas where there are no commercial users to support the system. Often those areas (such as low income areas and wildlands) are the very areas where public safety needs coverage the most. It is, thus, probable that public safety users will require private systems for mission critical applications well into the future. Again, public safety systems require reliability, interference protection, ubiquitous coverage, user control, excess capacity (for major emergencies), immediacy and security that commercial providers are unlikely to provide in a competitive environment.

2. Funding For Spectrum Migration

In paragraph 91 of the *Notice*, the Commission states its belief that the ability of state and local governments to finance new systems is tenuous at best. While this assumption may be true for many smaller systems, there are a number of larger users (such as the State of California) that are just completing massive studies that show that such expenditures will pay off fairly rapidly in increased effectiveness and management efficiency, as well as reduced maintenance and a plethora of related issues. If these larger users move to new spectrum,